

A Generalization on the Rules Governing the Flow of
Fluids Through Granular Layers

SOV/156-59-1-54/54

ASSOCIATION: Kafedra gidravliki Kazanskogo khimiko-tekhnologicheskogo
instituta im. S. M. Kirova (Chair of Hydraulics of the Kazan'
Institute of Chemical Technology imeni S. M. Kirov)

SUBMITTED: October 10, 1958

Card 3/3

USCMM-DC-60,911

Some Generalizations in the Hydraulics of a Grain Layer

SOV/153-2-3-28/29

n is characteristic of the different conditions. It may be seen from the diagram that three different conditions occur: laminar, transition, and turbulence. This method of representation makes it possible to find the equations for each granular material by 2-3 experiments. It could be shown that filtration and passing thru of a liquid in a floating layer are subject to the same rules. There are 1 figure and 21 references, 13 of which are Soviet.

ASSOCIATION:

Kazanskiy khimiko-tekhnologicheskii institut imeni S. M. Kirova,
Kafedra gidravliki (Kazan' Institute of Chemical Technology
imeni S. M. Kirov, Chair of Hydraulics)

SUBMITTED:

June 16, 1958

Card 2/2

STEPOCHKIN, B. F. (Kazan')

"Extention of the Laws of Hydrodynamics to Granular Porous to Granular Porous Media."

report presented at the First All-Union Congress on Theoretical and Applied Mechanics, Moscow, 27 Jan - 3 Feb 1960.

STEPOCHKIN, B.F.

Free sedimentation of particles of irregular shapes. Izv.vys.ucheb.
zav.; khim.i tekhn. 3 no.1:204-207 '60. (MIRA 13:6)

1. Kafedra gidravliki Kazanskogo khimiko-tehnologicheskogo
instituta imeni S.M. Kirova.
(Precipitation (Chemistry))

STEPOCHKIN, B.F., inzh.

Determining the velocity of flying particles of arbitrary form.
Teploenergetika 7 no.5:53-55 My '60. (MIRA 13:8)

1. Kazanskiy khimiko-tekhnologicheskii institut.
(Particles) (Aerodynamics)

ZAYNULLIN, Z.F.; STEPOCHKIN, B.F., otv. red.

[Compressing machinery (summaries of lectures); manual for correspondence students specializing in mechanical engineering] Kompessornye mashiny (konspekt lektsii); uchebnoe posobie dlia studentov mekhanicheskikh spetsial'nostei zachnogo fakul'teta. Kazan', Kazanskii khimiko-tekhnologicheskii in-t im. S.M.Kirova, 1964. 155 p. (MIRA 18:3)

Л.П.ОЩЕКИН, К.А., полковник, командир полка

The personal exemplariness of commanders is a guarantee of
successful flight work. Мат. сб. 48 no.7:45-47 J1 '65.
(MIRA 18:8)

STEPOCHKIN, M., starshina sverkhstrochnoy sluzhby, master bozhdeniya
tanka

In the slushy season. Starsh.-serzh. no.4(7):29 Ap '61.
(MIRA 14:7)
(Tanks (Military science)—Cold weather operation)

STEPOCHKINA, M.D., meditsinskaya sestra (Moskva)

How to make a blood transfusion. Med. sestra no.1:19-21

Ja '56
(MLRA 9:3)

(BLOOD--TRANSFUSION)

BEKAURI, N.V.; KOROLEV, V.I.; STEPOCHKINA, N.A.; RUSAKOVA, K.G.

Effect of pilocarpine and atropin on the size of the pupil and intraocular pressure in rabbits in normal conditions and in disorders of the innervation of the eye. Fiziol. zhur. 47 no.7:821-825 J1 '61.
(MIR 15:1)

1. From the Laboratory of Trophic Innervation, I.P.Pavlov Institute of Physiology, Leningrad.

(ALKALOIDS--PHYSIOLOGICAL EFFECT)
(PUPIL (EYE)) (INTRAOCULAR PRESSURE) (EYE--INNERVATION)

VASIL'YEVA, V.V.; STEPCHUKINA, N.A.

Large hemodynamic indices in the period of restoration following
muscular activity. Fiziol.zhur. 51 no.11:1308-1314 N '65.
(MIRA 18:11)

2. Kafedra fiziologii Instituta fizicheskoy kul'tury imeni
P.F.lesgafta, Leningrad.

STEPONAITIENE, Liudmila, kand. med. nauk; PAPECKIENE, S., red.;
PAKERYTE, O., tekhn.red.

[Let us eliminate diphtheria] Likviduokime difterija. Vilnius,
Valstybine politines ir mokslines literatūros leidykla, 1961.
15 p. (MIRA 15:3)

(DIPHTHERIA)

STEFONAITIENE, Liudmila; RAUBLYS, Petras; FABRIZIENE, A., red.

[The child grows] Valkas auga. Vilnius, Leidykla
"Mintis." 1965. 253 p. [In Lithuanian] (MIRA 18:6)

CIBIRAS, P., kand. med. nauk; DAKTA-AVICIENE, E., kand. med. nauk;
JARZEMSKAS, J., kand. med. nauk [deceased]; JOCEVICIENE, A.,
kand. med.nauk; KRIKSTOFAITIS, M., kand. med. nauk; NENISKIS, J.,
kand. med. nauk; STEPONAITIENE, L., kand. med. nauk; SURKIS, J.,
kand. med. nauk; SIIMANAS, S., kand. biolog. nauk; CEPULIS, St.,
prof.; KUPCINSKAS, J., prof.; LASAS, Vl., prof.; SIDERAVICIUS, Br.,
prof.; KANOPKA, E., dots.; IVINKYS, V., dots.; LABANAUSKAS, K.,
dots.; POLUKORDAS, H., dots.; BABUBLYS, P., doktor; CAPKEVICIUS, V.,
doktor; MAKARIUNAS, P., doktor; PAKONAITIS, P., doktor; STUCKA, R.,
doktor; SURGAILIS, H., doktor; PAULIUKONIENE, J., red.; ANAITIS, J.,
tekh. red.

[Health and diseases] Antrasis pataisytas leidimas. Vilnius,
Valstybine politines ir mokslines literaturos leidykla, 1961. 356 p.
(MIRA 15:3)

(HYGIENE) (PATHOLOGY)

STEPONAITIENE, L., med.m.kand.; RYBALKO, V.

Staphylococcal pneumonias in children. Sveik. apsaug. 8 no.8:
30-33 Ag'63.

1. Vilniaus Valst. V.Kapsuko v. universiteto Medicinos fakultetas.

*

STEPONAVICHYTE, A. V. [Steponaviciute, A.]; VIZBARAYTE, Ya. I. [Vizbaraite, J.];
YUTSIS, A. P. [Jucys, A.], akademik

Transformation matrix of a three-electron wave function between LS
and J1 couplings. Liet ak darbai no.3:41-52 '61.

1. Institut fiziki i matematiki Akademii nauk Litovskoy SSR i Vil'-
nyusskiy gosudarstvennyy universitet im. V. Kapsukasa.

STEFONAVICIENE, V.

Vitamin C content in food of some restaurants in Kaunas.
Stetk. apsaug. 6:31-34 S '64.

1. Kauno Valst. medicinos instituto higienos katedra. (Katedros
vedejas - prof. J. Sopauskas).

SPR. MAYEVN, L.P., Cand Med Sci -- (diss) "Peculiarities
of ^{the} diagnosis, clinic, and treatment of tubercular meningitis
in early age (up to three years)." Vil'nyis, 1966,
17 in (Min of Higher Education USSR. Vil'nyis
State Univ in V. Kapsukas) 10. copies (2L, 2-5, 137)

- 129 -

TILIS, A. Yu.; VENGERSKAYA, Kh. Ya.; STEPOVAYA, N. Ye. (Tashkent)

Diagnostic significance of the value of the coefficient of insufficient oxidation during the action of heavy metals. Gig. truda i prof. zab. no.3:30-34 '62. (MIRA 15:4)

1. Uzbekskiy nauchno-issledovatel'skiy institut sanitarii, gigiyeny i profzabolevaniy.

(METALS—TOXICOLOGY)
(OXIDATION, PHYSIOLOGICAL)

STEPONAVICIENE, V.

Vitamin C content in preserved vegetables. Svėlk. Apsaug.
no.4:33-36 '64.

1. Kauno Valst. medicinos instituto higienos katedra (Katedros
vedėjas - prof. J. Sopauskas).

100-10, 001.

Electronic control relay in electron beam equipment. Avia.
over, 10 nov. 77 by '65. (M. K. 15-1)

S/020/63/148/001/026/032
B101/B186

AUTHORS:

Stepovik, L. P., Shilova, A. K., Shilov, A. Ye.

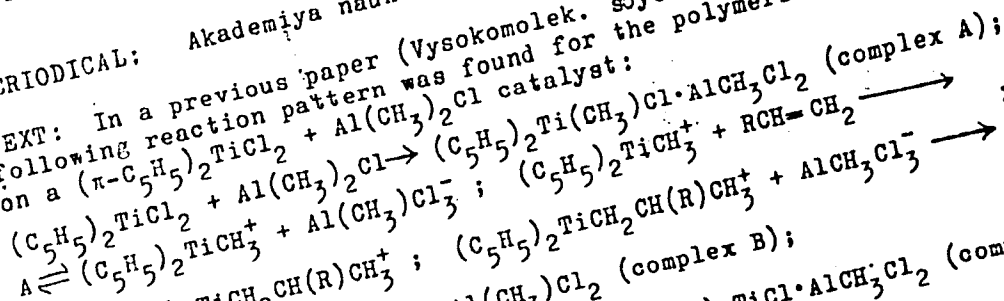
TITLE:

Kinetics and mechanism of the initiation of ethylene polymerization on a soluble Ziegler-type complex catalyst

PERIODICAL:

Akademiya nauk SSSR. Doklady, v. 148, no. 1, 1963, 122-125

TEXT: In a previous paper (Vysokomolek. soyed., 4, no.11 (1962)) the following reaction pattern was found for the polymerization of olefins on a $(\pi-C_5H_5)_2TiCl_2 + Al(CH_3)_2Cl$ catalyst:



Card 1/3

$\epsilon = 4, 1.7 \pm 0.1$
the specific effect

the ethylene polymerization is
the linear C_3H_7 radical is formed
a group $-CH_2-CH(CH_3)R$ is formed from the

S/020/63/148/001/026/032
B101/B186

Kinetics and mechanism of the ...

α -olefins of the formula $RCH=CH_2$; this group is easily converted to the isoolefin $CH_2=c(CH_3)R$, with the titanium being reduced and termination occurring. This generally holds for Ziegler catalysts by which ethylene, but no other α -olefins, can be polymerized. An active B complex is formed only with C_2H_4 . The ratio k_2/k_1 between the constant k_2 for chain propagation and k_1 for initiation was found to be 18.9, in good agreement with the value, 19, found from the ratio between maximum rate of polymerization at constant $p_{C_2H_4}$ and the initial rate of complex formation. ✓

These results do not confirm the assumptions made by J.S.W. Chien (J. Am. Chem. Soc., 81, 86 (1959)) and G.L. Karapinka, W.L. Carrick (J. Polym. Sci., 55, 145 (1961)). There are 3 figures and 1 table.

ASSOCIATION: Institut khimicheskoy fiziki Akademii nauk SSSR (Institute of Chemical Physics of the Academy of Sciences USSR)

PRESENTED: July 23, 1962, by N.N. Semenov, Academician

SUBMITTED: July 23, 1962

Card 3/3

RAZUVAYEV, G.A.; STEPPOVIK, L.P.; MITROFANOVA, Ye.V.

Reactions of aluminum triisopropylate with acyl peroxides. Izv.AN
SSSR. Ser.khim. no.1:162-164 Ja '64. (MIRA 17:4)

1. Nauchno-issledovatel'skiy institut pri Gor'kovskom gosudarstvennom
universitete im. N.I.Lobachevskogo.

RAZUVAYEV, G.A.; STEPNIK, I.P.; MITROFANOVA, Ye.V.

Reactions of aluminum triisopropylate with peroxides and
anhydrides. Zhur. ob. khim. 35 no.6:1095-1098 Je '65.
(MIRA 18:6)

1. Nauchno-issledovatel'skiy institut khimii pri Gor'kovskom
gosudarstvennom universitete imeni Lobachevskogo.

RAZVAYAN, I.I.; ZHILOV, I.I.

reactions of organoaluminum compounds with acyl peroxides and
anhydrides. Zhur. ob. khim. 35 no.9:1672-1676 5 '66.
(NIP 12.10)

I. Nauchno-Issledovatel'skiy Institut Khimii pri Gorkovskoy
gosudarstvennoy universitete imeni N.I. Lobachevskogo.

RAZUVAYEV, G.A.; STEPONIK, L.P.; PERVEYEV, F. Ya.; DEMIDOVA, V.M.;
ALANIYA, V.P.; SOKOLOV, N.A.; KHARCHENKO, V.G.; KRUPINA, T.I.;
KLIMENKO, S.K.; RASSUDOVA, A.A.; GORELIK, M.V.

Letters to the editors. Zhur. org. khim. 1 no. 12:2244-2246
D '65 (MIRA 19:1)

1. Nauchno-issledovatel'skiy institut khimii pri Gor'kovskom gosudarstvennom universitete (for Razuvayev, Stepovik).
2. Leningradskiy gosudarstvennyy universitet (for Perveyev, Demidova).
3. Moskovskiy institut neftekhimicheskoy i gazovoy promyshlennosti imeni Gubkina (for Alaniya, Sokolov).
4. Saratovskiy politekhnicheskoy institut (for Kharchenko, Krupina, Klimenko, Rassudova).

PEYVE, Ya.V. [Peive, J.]; ANSPOK, P.I. [Anspoks, P.]; PAKALN, G.Zh.
[Pakalns, G.]; KONONENKO-Stepovaya, T.A.; STEPVOY, A.I.

Mapping trace element contents of soils on a collective farm and
estimating the effectiveness of the use of fertilizers. Pochvo-
vedenie no.7:1-9 J1 '64. (MIRA 17:8)

1. Institut biologii AN Latvyskoy SSR..

M-2

USSR/Cultivated Plants - Grains.

Abs Jour : Ref Zhur - Biol., No 7, 1958, 29756

Author : Koz'mina, Ye.P., Stepovskaya, G.N.

Inst : -

Title : The Shatilovskaya 4, a New Buckwheat Variety.

Orig Pub : Inform. byul. Gos. komis. po sortoispyt. s. -kh. kul-tur
pri m-ve s. kh. SSSR, 1957, No 2, 26-29

Abstract : Shatilovskaya 4 variety buckwheat, cultivated by the
orlovskaya Oblast' Experimental Agricultural Station
(formerly the Shatilovskaya) from the Bogatyr' variety
by means of seed selection, has been districted for
rayons of the chernozem soil zone in 1956. It is close
to the Bogatyr' variety in biological and morphological
characteristics, although it surpasses the latter and a
number of other selected varieties in its grain yield and
quality in a number of rayons. The indices for the mean
harvests and grain yield for 1 hectare of shatilovskaya 4

Card 1/2

KOZ'MINA, Ye.P., doktor tekhn.nauk; STEPPOVSKAYA, G.N., agronom

Pay more attention to the cultivation of buckwheat. Zemledelie 7
no.3:63-67 Mr '59. (MIRA 12:4)

(Buckwheat)

STEPOVYY, V. [Stepovyi, V.]

Journey across our homeland ("Touring the reserves of the
Ukraine." Reviewed by V. Stepovyi). Znan. ta pratsia no.7:
22 J1 '61. (MIRA 14:8)
(Ukraine--National parks and reserves)

STEPONIC1, B

"Advanced agricultural technique is required in the cultivation of buckwheat." (p.105)
NOWE ROINICTWO (Panstwowe Wydawnictwo Rolnicze in Lesne) Warszawa, Vol. 3, no. 4,
Apr. 1954

SO: EAST European Accessions List, Vol 3, no. 8, August 1954

STEPOWSKI, Bronislaw

The pituitary gland and pregnancy. Ginek. pol. 34 no.1:14-26
'63.

1. Z II Kliniki Poloznictwa i Chorob Kobietych Sl. A.M. w
Bytomiu.

(PITUITARY GLAND)

STEPOWSKI, Bronislaw (Krakow)

Occupational activities during menstruation. Przegl. lek.,
Krakow 10 no.6:186 -188 1954.

(MENSTRUATION,

work in)

(WORK,

in menstruation)

STEPPOWSKI, Bronislaw (Krakow, Batorego 7)

Latent syphilis in pregnancy. Gin. polska 25 no.1:75-78 Ja-Mr '54.

(PREGNANCY, in various diseases,

*syphilis, latent)

(SYPHILIS, in pregnancy,

*latent)

STEPOWSKI, Bronislaw (Krakow, Batorego 7)

Gestational polyneuritis. Gin. polska 26 no.1:73-79 Jan-Mar 55.

(PREGNANCY, complications,
polyneuritis)

(POLYNEURITIS, in pregnancy.)

STEPOWSKI, Bronislaw

The theory of Alexander Rosner concerning the constitution of female sex organs in the light of recent concepts. Gin. polska 29 no.5: 589-594 Sept-Oct 58.

1. Z II Kliniki Poloznictwa i Chorob Kobiectych Slaskiej A. M. w Bytomiu Kierownik Kliniki: prof. dr med. B. Stepowski. II Klinika Poloznictwa i Chorob Kobiectych A. M. Bytom, ul. Batorego 15.

(GENITALIA, FEMALE, anat. & histol.
constitution characteristics, comparison of Rosner's
theory with current theories (Pol))

SHMAKIN, B.M.; STEPPAN, M.O.

Two sphenes from Archean pegmatites in the Aldan Shield.
Izv.vys.ucheb.zav.;geol.i razv. 4 no.10:59-65 O '61. (MIRA 14:12)

1. Moskovskiy geologorazvedochnyy institut imeni S.Ordzhonikidze.
(Aldan Plateau--Titanite)

COUNTRY : POLAND
 ORIGIN : Chemical Technology, Chemical Products and
 Their Applications, Synthetic Polymers.
 REF. NO. : Adm. No. 89 1120, No. 21015
 NO. : 1
 TITLE : Automobile parts made of plastics
 Tech. Review, 1982, 2, No 12-11, Biol.
 Intern. ITS, 7, No 5.
 SUMMARY : Described is the application of plastics in
 place of metal and other materials in the
 manufacture of automobile parts: bearings,
 pistons, handles, coverings, parts of brake
 cylinder and steering shaft, seats, etc. It
 has been established, for instance, that spring
 starters made of glass-reinforced plastic stand well
 after 15-25 thousand kilometers while bronze
 starters could not last more than 12 thousand
 kilometers. -- L. Sedov
 *Plastics.
 1/1

STEPHANE, I.

Economic situation of Vidzeme peasant-farmers in the 30's and 40's
of the 19th century. Vestis Latv ak no.6:29-36 '60.
(EEAI 10:9)

(Latvia--Peasantry

STEPUK, Ya.V.

6(4)

PHASE I BOOK EXPLOITATION

SOV/2882

Kalashnikov, Anatoliy Mikhaylovich, and Yakov Vasil'yevich Stepuk

Osnovy radiotekhniki i radiolokatsii, Kniga 1: Kolebatel'nyye sistemy (Principles of Radio Engineering and Radar, Book 1: Oscillation Systems) Moscow, Voenizdat, 1959. 354 p. No. of copies printed not given.

Ed.: S. N. Tikhonov, Engineer, Colonel; Tech. Ed.: G. F. Sokolova.

PURPOSE: This book is intended for students of military radio schools. It may be of interest to military officers engaged in the operation of radio equipment and also students of civilian schools studying radio and radar.

COVERAGE: The authors discuss resonant circuits transmission lines, waveguides, cavity resonators and antennas. Attention is given to physical aspects of processes taking place in these devices. Formulas and expressions in the book involve techniques of secondary-school mathematics. Introduction was written by Major V. G. Levichev; Chapter 1 by Major A. M. Kalashnikov;

Card 1/12

SLUTSKIY, Veniamin Zakharovich; FOGEL'SON, Boris Il'ich; LEVICHEV, Vladimir Grigor'yevich; YAGODIN, Oleg Gavrilovich; Primali uchastiye MUNVEZ-FRENKEL, I.Z.; STEPUK, Ya.V.; MATLIN, I.I., red.; SOLOMONIK, R.L., tekhn. red.

[Fundamentals of radar and radio engineering; display units, rectifiers, and transistor devices] Osnovy radiotekhniki i radio-lokatsii; indikatory, vypriamiteli i poluprovodnikovye pribory. By V.Z.Slutskiy i dr. Moskva, Voen.izd-vo M-va oborony SSSR, 1961. 355 p. (MIRA 14:12)

(Radar) (Radio--Equipment and supplies)

KALASHNIKOV, Anatoliy Mikhaylovich; STEPUK, Yekov Vasil'yevich;
GAYEVICH, V.N., red.; TIKHONOV, S.N., inzh.-polkovnik,
red.; KOKINA, N.N., tekhn. red.

[Fundamentals of radio engineering and radar; oscillatory
systems] Osnovy radiotekhniki i radiolokatski; kolebatel'-
nye sistemy. Izd.2., perer. Moskva, Voenizdat, 1962.
365 p. (MIRA 15:11)

(Radio) (Radar)

STEPUK, Y.V.

PHASE I BOOK EXPLOITATION

SOV/6294

Levichev, Vladimir Grigor'yevich, Yakov Vasil'yevich Stepuk and Boris Il'ich Fogel'son.

Osnovy radiotekhniki i radiolokatsii; radioperedayushchiye i radio-priyemnyye ustroystva (Fundamentals of Radio Engineering and Radar; Radio Transmitting and Receiving Devices). Moscow, Voenizdat M-va obor. SSSR, 1962. 494 p. 60,000 copies printed.

Ed.: I. I. Matlin; Tech. Ed.: R. L. Solomonik.

PURPOSE: This book is intended for students in schools of Radio Engineering who are taking courses in Radio Engineering and Radar. It should also be useful to military personnel concerned with the operation of radio engineering equipment, as well as to those students in civil schools studying these subjects.

COVERAGE: The book describes radio transmitting and radio receiving systems with emphasis on the physical aspect of the phenomena

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L 26409-66 EWT(1)/FSS-2 WR

ACC NR: AM5020527

Monograph

UR/

45

B+1

Kalashnikov, Anatoliy Mikhaylovich; Stepuk, YAkov Vasil'yevich

Principles of radio engineering and radar²⁴ oscillating systems (Osnovy radiotekhniki i radiolokatsii; kolebatel'nyye sistemy) 3rd ed, rev. Moscow, Voenizdat M-va obor. SSSR, 1965. 382 p. illus. 47000 copies printed.

TOPIC TAGS: oscillator theory, radio engineering, radar engineering, electromagnetic wave

PURPOSE AND COVERAGE: This textbook is intended for students in radio engineering schools specializing in radio and radar. It may also be of interest to military officers engaged in the operation and maintenance of radio and electronic equipment, as well as to students in civilian radio and radar schools. This textbook is one of four volumes on the subject "Principles of Radio Engineering and Radar." Oscillatory systems, electromagnetic power transmission lines, waveguides, cavity resonators, and antennas are covered in this volume. Considerable attention is paid to the physical side of the occurring phenomena. High school-level mathematics is used in this text.

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SUB CODE: 09, 17/ SUBM DATE: 26Feb65/ DTIC

Card 2/2 CC

L 26375-64 EWT(01)/FSS-2
ACC NR: AM5020529

Monograph

UR/

Levichev, V. G.; Stepuk, Ya. V.; Fogel'son, B. I.

Fundamentals of radio engineering and radar; radio transmitters and receivers (Osnovy radiotekhniki i radiolokatsii; radiopere-dayu-shchiye i radiopriyemnyye ustroystva) 2d ed., rev. Moscow, Voenizdat M-va obor. SSSR, 1965. 583 p. illus. 47,000 copies printed.

TOPIC TAGS: radio transmitter, radio receiver, radio transmitter theory, radio receiver theory

PURPOSE AND COVERAGE: This textbook is intended for students in radio engineering schools specializing in radio communications and radar. It may also be of interest to military officers engaged in the operation and maintenance of radio-communication, radar, and electronic equipment as well as to students in civilian radar and radio schools. This textbook is one of four volumes on the subject "Principles of radio engineering and radar". Radio transmitting and receiving equipment are covered in this volume. Considerable attention is paid to the physical side of phenomena occurring in the processes of transmission and reception. Ch. I., section 1, 2, 3, and 12 and Ch. II were written by V. G. Levichev; Ch. I sections 6, 7, and 8, by Ya. V. Stepuk; sections 4, 9, 10 and 11 by B. J. Fogel'son; and Ch. I section 5 by A. M. Kalashnikov. There are no references.

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ACC NR: AM5020529

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cc

STE UREIN, A. V.

Geography Study and Teaching

Speech by the old teacher of geography. Vop. geog. 27, 1951

9. Monthly List of Russian Accessions, Library of Congress, April 1953/2 Uncl.

STEPOUKHOWITCH, A. D.

"Cinetique et mecanisme de la destruction des hydrocarbues. VI. Cinetique de la destruction de l'ethane sous pression reduite." A. N. Dintzes, D. A. Kwjatkowski, A. D. Stepoukhowitch, A. W. Frost. (p. 1754)

SO: Journal of General Chemistry (Zhurnal Obshchei Khimii). 1937, Volume 7, No. 12.

CA

PROCESSES AND PROPERTIES

Kinetics and mechanism of thermal decomposition of isobutane at low pressures. A. D. Stupkovich (Rostov State Univ.), *J. Gen. Chem.* 15, 341-52 (1945) (English summary). The rate of decompn. of isobutane depends on initial concn. and increases with its pressure increase from 1 mm. to 7 mm. The rate decreases with increased extent of decompn. at 580° between 3 and 120 mm.; the reaction curve is of the self-hindering unimol. type. Thus the addn. of propylene hinders the reaction up to 10%, after which the effect becomes smaller and the general equation expressing the effects of a hindering agent is $W = a/b + KC$, where a , b , and K are consts., W is decompn. rate and C is propylene concn. The results indicate that propylene hinders the reaction, through the chain breaking by formation of inactive radicals, so that the chain length reaches only 50 units. G. M. Kosolapoff

Lab Phys Chem Rostov State Univ.

ASH-SL-A METALLURGICAL LITERATURE CLASSIFICATION

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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CA

30

Rapid method for vulcanizing rubber to ebonite. I
A. D. Stepukhovich. *J. Applied Chem. (U.S.S.R.)* 20, 110-14 (1947) (in Russian).—Work was carried out to develop a rapid method for manufg. completely vulkanized ebonite from raw rubber without reducing the productivity of existing equipment. Factors to be considered are the use of accelerators, especially in combination with other chemicals or combinations of more than 1 accelerator; the use of the heat of vulkanization from the 1st stage of the reaction to promote vulkanization in the middle and later stages; the dimensions and shape of the mold, and, less important, the S concn., press temp., and rubber plasticity. The actual application of these factors to the development of a method of rapid vulkanization and the exptl. results obtained will be described in the next paper of this series. H. K. Livingston

ASB 54.4 METALLURGICAL LITERATURE CLASSIFICATION

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

Inhibition of the vulcanization of rubber. II. A. D. Stepanukovich (Saratov Phys. Research Inst.), *Zhur. Priklad. Khim.* (J. Applied Chem.) 22, 905-10(1949); cf. C.A. 42, 404f. —Analysis of the data of van Rossem shows a 1st-order rate law for combination of S, with $k \sim 8 \times 10^{-4} \text{ min.}^{-1}$, to hold up to about 8% of the combined S ($\sim 20 \text{ hrs.}$). A similar evaluation of the data of Weber (*Kolloid. Z.* 1, 31, 65(1906)) on the rate of combination of S in a natural rubber-S mixt. (100:10) at 120° shows a sharp fall in the 1st-order k from $2.45 \times 10^{-4} \text{ (min.}^{-1})$ at 7.1% S bound to 0.85×10^{-4} at 22.5% S (300 min.); at 135° k reaches a min., $\sim 2.9 \times 10^{-4} \text{ min.}^{-1}$, at about 30% S bound ($\sim 150 \text{ min.}$), then rises slowly because of an exothermal process. Normally, the 1st-order rate const. for the vulcanization of rubber decreases with the progress of the reaction, i.e., the reaction is self-inhibited. Accordingly, its rate is in good agreement with the equation of Dintzes and Frost (C.A. 28, 2598f) $dx/dt = k(1-x)[1 + \beta/(1-x)]$; the data of Weber at 120° give, with $\beta = 1$, $10^4 k = 1.0$,

satisfactorily const. up to the combination of 22.5% S (300 min.) (evaluated from the integrated equation $(1/t)\ln[1/(1-x)] = k - \beta(x/t)$, by plotting $(1/t)\ln[1/(1-x)]$ against x/t). This cannot be explained by the proximity to equil., which lies far off. It is a case of rupture of chains by certain products. While the nature of the inhibiting products is unknown, the fact that vulcanization is initiated by oxidants suggests that easily oxidizable substances ought to be inhibitors. This is confirmed by observations of the inhibiting effects of aldehydes. At 150° , with the initial mixt. (neutral rubber: S = 100:10) the 1st-order k after 20, 30, 40 min. (32.36, 42.98, 51.61% of the initial S combined) is, resp., $10^4 k = 1.95, 1.87, 1.81 \text{ min.}^{-1}$; with 1.7% BzH added, 1.64, 1.54, 1.53 (28.03, 37.73, 45.74% S); with 1.7% furfural, 1.71, 1.57, 1.50 (28.06, 37.63, 45.16%); with 1.7% paraldehyde, 1.80, 1.76, 1.69 (31.51, 41.06, 49.13%). the inhibitory power of the aldehydes follows approx. the order of their oxidizability. The known inhibiting action of sugars parallels that of the aldehydes. Possibly, the inhibition involves combination of H_2S or of active S atoms. N. Thon

CA

2

Kinetics and mechanism of the retardation of thermal decomposition of paraffin hydrocarbons by additions. A. D. Buzukhovich (Univ., Saratov). *Zhur. Fiz. Khim.* 24, 813-18 (1980); cf. *C.A.* 60, 3252^o.—The rate W of decompn. is reduced by $C\%$ of addn. according to equation $W = W_0 + a/(1 + bC)$; W_0 , a , and b are const. This equation results if the inhibition is due to deactivation of active radicals by the mole. added and the rate of deactivation is proportional to the product of concn. of active radicals and probability of their collision with the mole. added. It agrees with the expts. on cracking C_4H_{10} in the presence of propene, cf. *C.A.* 31, 8277^o, and on cracking of propene, cf. Szwarc, *C.A.* 43, 8270^g.

J. J. Bierman

CA

2

Theory of the kinetics of two consecutive nonreversible reactions of the second order. A. D. Bagulovich and L. M. Timonin (Chernyshevskii Univ., Saratov). *Zhur. Fiz. Khim.* 25, 143-6 (1961).—Reactions of the biotic type $2A \xrightarrow{k_1} 2A_1 \xrightarrow{k_2} A_2$ obey the rate laws: $dx/dt = 2k_1(a-x)^2$ (1) and $dy/dt = k_2(x-y)^2$ (2). From (1), $x = at/(1+bt)$ (3), where $b = 2k_1a$. Putting (3) into (2): $dy/dt = k_2y^2 - 2k_2xy + k_2x^2$ (4), a form of the Riccati equation. The integration of (4) gives: $u = x - y = [n_1 - n_2C(1+bt)^{-1}]/(1+bt)^2$ (5) and $y = [C(abt + n_1)(1+bt)^{-1} - abt + n_1]/(1+bt)^2$ (6), where $n_1 = b_1(n_2 - n_1)/b$, $C = n_1/n_2$ and n_1, n_2 are the roots of $b_1x^2 - b_2x - ab = 0$. Curve (5) has a max. u_m for $t = t_0$ and curve (6) has an inflection point at the same value $t = t_0$. The value of u_m depends only on the ratio $b_1/b_2 = r$ and increases with r . The inflection point of (6) shows that A_2 is formed at an increasing rate at first and that an induction period occurs for $b_1 \ll b_2$ if b_2 is small. When $b_1 \ll b_2$ with a large b_1 , (6) goes into (3) and A_2 is formed according to an apparently bimol. process, except in the very first stages of the reaction. Applications will be given in a subsequent paper. Michel Mandart

Chemical Kinetics & Physics

CA

Kinetics of ethane decomposition at pressures higher than atmospheric. A. D. Stepanukovich and F. M. Mitenkov (Saratov State Univ.). *Zhur. Fiz. Khim.* 25, 203-11 (1951). The rate const. k for the thermal decompn. of ethane at 635° and at p not less than 1 atm. is calcd. as a

function of the % decompn. x (up to 12%, but still far from equil.) and the calcd. values are compared with the exptl. data of Dintses, *et al.* (C.A. 31, 7318⁹) who showed that k decreases for increasing values of x . Three different kinetic schemes are assumed and for each one a differential equation is set up and numerically solved, the rate consts. of the individual reactions being calcd. by the transition-state method. The concn. of $\dot{\text{C}}_2\text{H}_5$ radicals is neglected throughout. The first scheme: $\text{C}_2\text{H}_6 \rightleftharpoons 2\dot{\text{C}}_2\text{H}_5$ (1), $\text{R}(\text{H}, \text{CH}_3, \text{C}_2\text{H}_5) + \text{C}_2\text{H}_6 \rightarrow \text{RH} + \text{C}_2\text{H}_5$ (2), $\text{C}_2\text{H}_5 \rightarrow \text{C}_2\text{H}_4 + \text{H}$ (3), $\text{R} + \text{R} \rightarrow \text{M}$ (4) is rejected, because calcs. show that it leads to a monotonous increase of k with x . The 2nd scheme consists in (1), (2), (3), (4)

and $\text{R}(\text{H}, \text{CH}_3) + \text{C}_2\text{H}_5 \rightarrow \text{CH}_3\text{—}\dot{\text{C}}\text{—CH}_3$ (5) and leads to

the expected decrease in k with the progress of the decompn. Reaction (5) is thus essential; its activation energy E_5 is calcd. at 16 kcal. or less. Higher values of E_5 , e.g. 22 kcal., as given by Rice and Polley (C.A. 22, 4037⁹) increase the discrepancy between calcd. and exptl. k values. The 3rd scheme is made of (1), (2), (3), (4), (5) and $\text{R} + \text{H} \rightarrow \text{M}$ (6). Then at $p = 1$ atm., for $x = 4, 5, 6, 7$, and 12%, resp., $k_{\text{calcd.}} \times 10^4 = 30.02, 19.02, 16.97, 17.88$, and 7.97, whereas $k_{\text{exptl.}} \times 10^4 = 40, 40, 30, 25, 16$. At $p = 3.9$ atm., for $x = 3, 4, 8$, and 10%, resp., $k_{\text{calcd.}} \times 10^4 = 48.69, 44.25, 14.28, 6.14$, whereas $k_{\text{exptl.}} \times 10^4 = 30, 18, 9, 12$. Michel Humbert

STEPUKHOVICH, A.D.

**TT.322 [Steric factors in unimolecular and bimolecular reactions] Stericheskie faktory v monomolekuliarnykh i bimolekuliarnykh reaktsiiakh. Zhurnal Fizicheskoi Khimii, 26(2): 145-155, 1952.

STEPUKHOVICH, A.D.; FINKEL, A.G.

Kinetics of the decomposition of ethane in the presence of propylene at low pressures. Zhur. Fiz. Khim. 26, 1413-18 '52. (MLRA 5:12)
(CA 47 no.13:6229 '53)

1. Saratovskiy gosudarstvennyy universitet.

Studied the kinetics of the decompn of ethane when propylene is added at two different temps. and pressures of ethane. Demonstrated that the velocity of the decompn of ethane is slowed down in accordance with A. D. Stepukhovich's eq. when propylene is added. With increasing temp, the retarding effect of propylene is reduced.

STEPUKHOVICH, A.D.

STEPUKHOVICH, A.D.; FINKEL, A.G.

Kinetics and mechanism of the decomposition of ethane in the presence of propylene. Zhur. Fiz. Khim. 26, 1419-24 '52. (MLRA 5:12)
(CA 47 no.13:6230 '53)

1. Saratovskiy gosudarstvennyy universitet.

Considers the mechanism for the decomposition of ethane in the presence of propylene where the reactions of the active radicals combining with propylene to form inactive radicals play a principal part. An equation for the relationship between the velocity of the reaction and the concentration of the inhibitor can be derived from the assumed scheme. Gives an explanation for the decrease in the inhibiting action of propylene as the temp is increased. The relative effect of the inhibiting action of the additive depends on the initial conc. of the hydrocarbons. At the temps and quantities of the inhibitor (propylene) in question the effect is inversely proportional to the initial conc of the hydrocarbon.

STEPUKHOVICH, A.D.

The kinetics and the mechanism of the thermal decomposition of isobutene at low pressure. A. D. Stepukhovich and P. M. Buzichkov (Saratov State Univ., Saratov State Obshch. Khim., Akad. Nauk S.S.S.R. 1, 234-40 (1963). The thermal decomposition of isobutene at low pressures (2.39-24.8 mm.) up to 600° was detd. by the static method. The value of the const. of the decomposition rate k was calcd. for different pressures p , temps. $T^{\circ}K.$, and percentage of decomposition, x , for $t = 2$ min. on the assumption of a unimol. reaction. Up to $p \sim 100$ mm. the plots of $1/k$ vs. $1/p$ for 811 and 828°K. are straight lines expressed by the equation $1/k = A + (B/p)$ (A and B can be calcd. by substituting the Boltzmann const., a probability factor, and k at high pressures). At first k increases up to $x = 20\%$, then it decreases. A plot of k vs. x/t at 864° within the range of p between 3.08 and 5.1 mm. is a straight line. These facts led to the conclusion that k decreases not because of the approaching equil. but because of the throttling effect of the products of decomposition. (cf. Dintzes, C.A. 33, 4855). The initial reaction starts at 538° and the energy of activation $E = 64 \pm 4$ kcal./mol. The chain mechanism of the thermal decomposition of isobutene (cf. Szwarc, C.A. 43, 5270a) fails to explain satisfactorily the available exptl. data.

I. Benicowitz

STEPUKHOVICH, N.

USSR
GERM.

✓ Catalytic thermopolymerization of isobutylene on quartz at low pressures. A. D. Stepukhovich and F. M. Mitenkov (Saratov State Univ.). *J. Gen. Chem. U.S.S.R.* 25, 208-7 (1953)(Engl. translation); *Zhur. Obshchei Khim.* 23, 200-3 (1953).--In the thermal decompn. of isobutylene, it was noted that in the pressure region below 2 mm., and at a temp. of 511-525°K., a catalytic thermopolymerization of isobutylene occurs on the quartz walls of the app., and predominates over decompn. It is assumed that decompn. also occurs at higher pressures, but it is completed too rapidly to be observed. A hypothetical mechanism, agreeing with the facts, is proposed. J. J. Casey

STEPUKHOVICH, A.D.

Kinetics and mechanism of the decomposition of propane in the presence of isobutylene and propylene as inhibitors. A. D. Stepukhovich and E. S. Shver (State Univ., Saratov). *Zhur. Fiz. Khim.* 47, 1013-24 (1973); cf. *C.A.* 44, 8751a. The rate of decomposition of propane (I) containing various proportions between 0 and 30% of propylene (II) and isobutylene (III) and having a I partial pressure of 10 mm. was observed. The extent of decomposition of I is tabulated and graphed as a function of time, temp., and olefin content. III is a more effective inhibitor than is II. The decomposition of I is a chain reaction described by the equation $1/(w - w_0) = A + BC$, where w , w_0 , A , B , and C are over-all reaction rate, 2.32×10^{-4} at 590° or 5.75×10^{-4} at 620° , 2.76×10^{-4} at 590° or 1.32×10^{-4} at 620° , 1.69×10^{-11} at 590° or 0.73×10^{-11} at 620° , and olefin content, resp. The activation energies for the radical reactions $\bar{R}(H, CH_3) + III \rightarrow RH + iso-C_4H_8$, $\bar{R}(H, CH_3) + II \rightarrow RH + C_3H_6$, and $\bar{R}(H, CH_3) + \text{wall} \rightarrow \text{adsorbate}$ are 4.1, 6.4, and 12.3 kcal., resp. J. W. Loweberg, Jr.

USSR/Chemistry - Cracking; Gaseous
Hydrocarbons

Dec 53

"Kinetics and Mechanism of the Decomposition of Hydrocarbons. Comm 3. Kinetics and Mechanism of the Decomposition of Butane (I) at Low Pressures in the Presence of Isobutene (II) or Propene (III) Acting as Retardants," A. D. Stepukhovich, A. M. Chaykin, Saratov State U im N. G. Chernyshevskiy

Zhur Fiz Khim, Vol 27, No 12, pp 1737-47

At pressures of 1-30 mm and temps of 548° and 573°, decompn of I is a self-inhibiting reaction. The kinetics of the decompn of I in the presence of II

275T9

or III were investigated in detail and the decompn shown to be a chain reaction. The retardant effect of II was found to be greater than that of III. II and III break the reaction chain by transforming the active radical into an inactive one. The consts of individual reactions and of the wall effect in stopping reaction chains were detd. The chain lengths were calcd and the concns of CH₃ radicals estd.

Stepukhovich, A. D.

USSR.

The kinetics of the stepwise decomposition of paraffin hydrocarbons in the presence of inhibitors. A. D. Stepukhovich (N. G. Chernyshevskii State Univ., Saratov). Doklady Akad. Nauk S.S.S.R. 89, 899-902 (1953); cf. C.A. 44, 8754a; Semenov, C.A. 48, 29a. —Math. Expressions are derived for the inhibiting action of small units of admixts. (mols. having a double bond) in the decompn. of paraffin hydrocarbons from the stepwise scheme for the decompn. The effect of these admixts. depends on the initial pressure of the hydrocarbon. J. Ravtar Leach

USSR/Chemistry - Reaction Kinetics; Cracking and Combustion

21 Apr 53

"Kinetics and Decomposition Mechanism of Propane in the Presence of Added Organic Molecules,"

A. D. Stepukhovich and E. S. Shver, Saratov State U.

DAN SSSR, Vol 89, No 6, pp 1067-1070

Studied the action of addns of isobutylene and propylene on the thermal decompn of propane at 620° and 10 mm pressure of propane. Isobutylene inhibits the thermal decompn of propane twice as much as propylene. Presented by Acad N. N. Semenov, 24 Feb 53.

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STEPANKHOVICH, A. D.

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Journal of Applied Chemistry
June 1954
Fuel and Fuel Products

Kinetics and mechanism of decomposition of [gaseous] paraffins 62
in the presence of some inhibitors. A. D. Stepankhovich (*Dokl.
Akad. Nauk. SSSR*, 1953, 90, 213-216). The inhibiting influence
of addition of iso-butene and propene on the thermal decomposition
of propane, n- and iso-butane between 550 and 620° is studied and
the activation energies of the interaction of active free-radicals
with mol. of additives are estimated. The activation energies can
be assumed constant for any given additive. The stronger inhibiting
action of iso-butene can be explained by assuming that the mechan-
ism of inhibition involves breaking away of a H atom from the
olefine mol. S. K. Lachowicz.

Saratov State Univ., in N.G. Chernyshevsky.

STEPURHEVICH A.D.

Steric factors of some elementary reversible reactions of addition of atomic hydrogen to unsaturated molecules. A. D. Stepurheovich, Doklady Akad. Nauk S.S.S.R. 92, 1131b. Steric factors for elementary uni- and bimol. addn. reactions (S_1 , S_2 , resp.) of at. H to $\text{CH}_2=\text{CH}_2$ (I), $\text{CH}_3\text{CH}=\text{CH}_2$ (II), $(\text{CH}_3)_2\text{C}=\text{CH}_2$

(III), and $\text{HC}\equiv\text{CH}$ (IV) were calcd. (cf. C.A. 47, 4707). At 920°K. S_1 for I and II is 1, 0.6; for III at 840°K. 3×10^{-2} , for IV at 846°K. 2×10^{-2} . Corresponding values for S_2 are 3×10^{-3} , 4×10^{-3} , 1×10^{-3} , and 1×10^{-3} , resp. It is postulated that at these temps. the rotational sums contribute most and the vibrational magnitude remains the same (~ 1). Michael Dymicky

STEPUKHOVICH, A. D.

USSR/Chemistry - Hydrocarbons,
Reaction Kinetics

11 Sep 53

"Kinetics of the Chain Decomposition of Paraffin
Hydrocarbons," A. D. Stepukhovich

DAN SSSR, Vol 92, No 2, pp 373-376

Attempts to give a more up-to-date theory on the
kinetics of the chain decompn of paraffin hydro-
carbons on the basis of new exptl facts. Derived
a differential equation for the chain decompn of
paraffin hydrocarbons and applied it to ethane.
Presented by Acad N. N. Semenov 21 Jul 53.

269T22

Stepukhovich, A.D.

USSR/Chemistry - Hydrocarbon decomposition

Card 1/1 Pub. 147 - 2/27

Authors : Stepukhovich, A.D., and Derevenskikh, L.V.

Title : The kinetics and mechanism of hydrocarbon decomposition. Part 2. The kinetics and mechanism of ethane decomposition at low pressures.

Periodical : Zhur. fiz. khim. 28/2, 199-203, Feb 1954

Abstract : The effect of isobutylene additions on the decomposition of ethane at low pressures was investigated. The quartz walls of the reactor contaminated with isobutylene decomposition products were found to have accelerated the rate of ethane decomposition. The isobutylene in itself inhibits the catalyzed and non-catalyzed ethane decomposition and saturation takes effect on the isobutylene. The kinetics of ethane decomposition was established at 635° C in the presence of isobutylene and the catalytic effect of the contaminated reactor walls was determined. The possible mechanism of inhibition reaction with isobutylene, consisting in substituting the active radicals with less active ones, which leads to the contraction of the chain, was evaluated. Nine references : 7-USSR; 1-USA and 1-English (1935-1953). Tables; graphs.

Institution : The N. G. Chernishevskiy State University, Saratov

Submitted : January 1, 1953

STEPUKHOVICH, A.D.
USSR/ Physical Chemistry - Kinetics. Combustion. Explosives. Topochemistry.
Catalysis

B-9

Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 11216

Author : III. A.D. Stepukhovich and G.I. Kats

IV. A.D. Stepukhovich and G.P. Vorob'yeva

V. A.D. Stepokhovich and L.V. Derevenskikh

VI. Stepukhovich A.D., Stal'makhova L.S., Yerevin V.V.

VII. Stepukhovich A.D., Derevenskikh L.V.

Title : Kinetics and Mechanism of Decomposition of Hydrocarbons.

III. Kinetics and Mechanism of Thermal Decomposition of Divinyl at Low Temperatures.

IV. Kinetics and Mechanism of Decomposition of Isobutane in the Presence of Isobutylene and Propylene as Inhibitors

V. Kinetics of Thermal Decomposition of Gaseous Paraffins in the Presence of Added Divinyl

VI. Kinetics of Thermal Decomposition of Gaseous Paraffins in the Presence of Acetylene

VII. Kinetics and Mechanism of Decomposition of Gaseous Alkanes in the Presence of Allene

Orig Pub : Zhurnal fiz. khimii, 1954, 28, No 7, 1174-1185; No 8, 1361-1370; No 10, 1720-1724; No 11, 1878-1881; 1955, 29, No 12, 2129-2132

1/4

USSR/ Physical Chemistry - Kinetics. Combustion. Explosives. Topochemistry.
Catalysis

B-9

Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 11216

Abstract : III. The velocity constant of divinyl decomposition, calculated in accordance with the equation of the reactions of second order, varies linearly, at 570-620° and 2-30 mm Hg pressure, depending on $1/p_0$ (p_0 -- initial pressure). Calculated were mean duration of life of divinyl molecule in activated state, 5.10^{-8} seconds, the number of kinetically active degrees of freedom 20, and dissociation energy of divinyl $E = 79.4 \pm 1.9$ kcal/mole. Decomposition of divinyl conforms to the Dintsess-Frost equation and is interpreted as a chain reaction undergoing spontaneous inhibition by decomposition products. Additions of divinyl accelerate decomposition of C_2H_6 at 620°. Accelerative action of divinyl reaches a limit at 12%.

IV. By the method of inhibiting additives (RZhKhim, 1953, 8215) a study was made of thermal decomposition of isobutane at pressure of 10 mm Hg and temperatures of 548 and 573°. Addition of 0.5% slows down the decomposition sharply, on increase of the addition from 1 to 7% effectiveness of its action decreases, and with 7-10% saturation is reached (first order velocity constant acquires constant value). Under the same conditions inhibition by isobutylene is more effective than by propylene.

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USSR/ Physical Chemistry - Kinetics. Combustion. Explosives. Topochemistry.
Catalysis

B-9

Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 11216

Experimental data on inhibiting action of additives fit the equation:
 $1/W - W_0 = A + BC$ (1), wherein W -- reaction velocity, W_0 -- residual
velocity, A and B -- constants, $C(\text{add})$ -- concentration of additive,
which proves the chain nature of the decomposition. The primary effect
is decomposition of isobutane molecule at C-C bond. Inhibiting action
of olefins is explained by removal of H atom by active radical from mo-
lecule of additive with formation of inactive unsaturated radicals. By
means of equation (1) were calculated velocity constants of the reaction
of chain termination at the wall and at molecules of additive. Activa-
tion energy of inhibiting reactions brought about by isobutylene and pro-
pylene is, respectively, 5.6 and 8.5 kcal/mole, that of the reaction of
termination at wall, 14.7 kcal/mole.

V. Study of kinetics of thermal decomposition of propane, butane and
isobutane, in the presence of divinyl, with initial pressure of decom-
posing hydrocarbons ~ 10 mm Hg, and at temperatures of 510-593°. Ad-
ditions of divinyl, which is a product of cracking of hydrocarbons, do
not inhibit decomposition of these hydrocarbons. Absence of inhibiting

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USSR/ Physical Chemistry - Kinetics. Combustion. Explosives. Topochemistry.
Catalysis

B-9

Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 11216

action of divinyl is correlated with greater durability of C-H bond, in CH_2 groups, at the double bond carbon, in comparison with durability of C-H bond in methyl groups of propylene of isobutylene.

VI. Study of kinetics of thermal decomposition of propane and butanes in the presence of 1-20% C_2H_2 at pressure of decomposing hydrocarbons ~10 mm and temperatures of 500-600°. Additions of C_2H_2 do not inhibit rate of decomposition. Increased values of decomposition velocity constant of propane at pressures below 10 mm, in the presence of C_2H_2 , are due to the fact that that C_2H_2 impedes diffusion of active centers to the walls. Thermal calculations have shown the possibility of a reaction between atomic hydrogen and C_2H_2 , with formation of highly reactive vinyl radical which is stable under cracking conditions.

VII. Additions of allene inhibit cracking of C_3H_8 and iso- C_4H_{10} , but do not affect decomposition of C_4H_{10} . Mechanism of inhibition resides in addition of H atoms to allene molecule with formation of little active allyl radicals. Absence of inhibition in the case of C_4H_{10} is due to the fact that increase of latter occurs essentially with formation of CH_3 radical. Communication II, see RZhKhim, 1957, 393.

4/4

STEPUKHOVICH, A. D.

USSR/ Chemistry Kinetics theory

Card : 1/1

Authors : Stepukhovich, A. D., and Bakhareva, I. F.

Title : The kinetics theory of two successive one-sided reaction of different order

Periodical : Zhur. fiz. khim. 28, Ed. 6, 970 - 975, June 1954

Abstract : An accurate solution to the kinetic problem of two one-sided successive reactions of different order was obtained through integration of differential equations applicable to the rate of such reactions. It was established that two successive reactions of different order, at a certain constant ratio, can take place either in accordance with the bi- or mono-molecular law. Final terms for the calculation of changes, occurring during the concentration of basic substances, intermediate and final products, are presented. Four USSR references. Graph.

Institution : The N. G. Chernishevskiy State University, Saratov

Submitted : November 22, 1953

Stepukhovich, A. D.

USSR/Chemistry - Physical chemistry

Card 1/1 : Pub. 147 - 3/22

Authors : Stepukhovich, A. D.

Title : Problem concerning the A. V. Frost and A. I. Dintses kinetic equation

Periodical : Zhur. fiz. khim. 28/11, 1882-1888, November 1954

Abstract : The universality of the A. V. Frost and A. I. Dintses empirical equation in its application to kinetics of thermal decomposition of paraffins, certain diene hydrocarbons and during rubber vulcanization processes, is discussed. The equation is based on a radical-chain system of decomposition in which the wall of the vessel acts not only as a chain separation factor but also as a chain initiator. The Frost-Dintses equation was found to be best applicable to instances of heterogeneous reactions. Theoretical terms for the calculation of the inhibition coefficient and constants of the Frost-Dintses equation are presented. Fifteen references: 14-USSR and 1-USA (1928-1954).

Institution : The N. G. Chernishevskiy State University, Saratov

Submitted : September 14, 1953

USSR/Chemistry - Physical chemistry

Card 1/2 : Pub. 147 - 2/27

Authors : Stepukhovich, A. D.

Title : About the equilibrium during reactions participated by radicals

Periodical : Zhur. fiz. khim. 28/12, 2088-2094, Dec 1954

Abstract : The equilibrium constants of a reversible decomposition reaction of an ethyl radical into ethylene and atomic hydrogen was calculated and the calculation results were compared by various methods. It is shown that the approximated thermodynamic method of calculating equilibrium constants of the reversible decomposition reaction leads to a highly reduced value. The chemical constants of C_2H_4 and C_2H_5 were computed by means of statistical methods. It is shown that the equilibrium in the $C_2H_5 \rightleftharpoons C_2H_4 + H$ reaction is displaced toward C_2H_5 and that the latter should be taken into consideration during the cracking of ethane and other hydrocarbons with the aid of stable radicals. The perspective

Zhur. fiz. khim. 28/12, 2088-2094, Dec 1954

(Additional Card)

Card 2/2

Abstract : of utilizing the Nernst heat theorem for the calculation of equilibriums in radical reactions is discussed. Fourteen references ; 12 USSR; 1 USA and 1 English (1932-1954). Tables.

Institution : State University, Saratov

Submitted : September 23, 1953

STEPURNOVICH, A. D.

The residual cracking rate of fully inhibited paraffin hydrocarbons. A. D. Stepukhovich (N. G. Chernyshevskii State Univ., Saratov, U.S.S.R. Akad. Sci. 611-12 (1959); cf. C.A. 44, 5764a). The simplest explanation for the re-

sidual rate consists in considering it as the rate of the initial disson. of the hydrocarbon into radicals; it may also be considered as the rate of some residual chain reaction, corresponding to some stationary state of inhibited cracking.

W. M. Sternberg

fm JMB
MT

5-
1-46:4g
1-46:5d

STEPUKHOVICH, A. D.

Steric factors of the reversible combination of atomic hydrogen with propylene. A. D. Stepukhovich and Yu. S. Brusilovskaya. *Uchenye Zapiski Saratov. Univ.* 36, 41-9 (1964); *Referat. Zhur., Khim.* 1956, Abstr. No. 3424.—Calcd. by the method of transition state on the basis of geometrical models and the vibration frequencies of the mols. of propylene and propane, steric factors for the reaction $(CH_3)_2CH \rightleftharpoons C_3H_6 + H$ agree well with the exptl. data of Melville and Robb (*C.A.* 44, 1784k). From the velocity consts. of the direct and the reverse reactions, and the equil. const. is calcd. the transmission coeff. for dissocn. of $(CH_3)_2CH$. The greater energy of dissocn. of $(CH_3)_2CH$ is the cause of its stability at high temp. A. N. Pastoff

3
1-4B3d
1-4B4
1-4B2c (j)
2-MAY

11
12

STEPORUKHOVICH, A. D.

Rate and equilibrium constants for the reversible reaction of binding atomic hydrogen by propylene. A. D. Steporukhovich and Yu. S. Brusilovskaya. *Uchenye Zapiski Saratov. Univ.* 36, 51-8 (1954); *Referat. Zhur., Khim.* 1956, Abstr. No. 12404.—On the basis of calen. of stereochem. factors s of the reversible reaction $\text{CH}_3\text{CHCH}_2 \rightleftharpoons \text{C}_2\text{H}_4 + \text{H}$, the rate and equil. const. were calcd. at various temps., both kinetic and thermodynamic methods being used. Calcd. entropies of activation for the reaction in both directions agree with values for s . J. Mloszewski

3
1-4E2d
1-4E4y
1-4E2c(7)
2-MAY

11
12

STEPUKHOVICH, A.D.

4600
// Kinetics and the mechanism of retarded decomposition of
paraffins with the participation of some active centers.
A. D. Stepukhovich (N. G. Chernyshevskii State Univ.,
Saratov, USSR; Akad. Nauk S.S.S.R. 98, 111-14
(1954).—On the basis of decompn. of C₁₁H₂₄ through the
active intermediates, a math. relation is developed that
proves that the reported relation (C.A. 48, 12526a, 13370a)
can be extended to the retarded decompn. of paraffins
with active centers. Michael Dymjcky

USSR/ Chemistry - Physical chemistry

Card 1/1 Pub. 22 - 39/56

Authors : Stepukhovich, A. D., and Etingof, E. I.

Title : Steric factors of elementary reversible reactions of H-, and CH₃-radicals with simple olefines

Periodical : Dok. AN SSSR 99/5, 815-818, Dec 11, 1954

Abstract : The results obtained by calculating the steric factors of reversible elementary reactions of H-, and CH₃-radicals, with olefine type molecules, are presented. It was established that the steric factors involved in the reactions of the hydrogen atom separation from the olefine molecules by means of the H-radical have one and the same order of magnitude. The steric factors of reversible reactions between vinyl-, allyl- and isobutenyl-radicals and a methane molecule have an order of magnitude approximately equal to the steric factor of direct reactions. The theoretically sharp difference, in the steric factors in analogous reactions with H- and CH₃-radicals, is explained. Eight references: 6-USSR; 1-USA; 1-GB; 1-DE (1949-1953). Table.

Author's address: M. N. S. Stepukhovich, Leningrad State University, Gorky
 Date of publication: Dokl. Akad. Nauk SSSR, June 25, 1954

USSR/Chemistry - Hydrocarbon cracking

Card 1/1 Pub. 22. - 43/63

Authors : Stepukhovich, A.D., and Tatarintsev, V.V.

Title : Cracking of paraffin hydrocarbons initiated by azomethane additions

Periodical : Dok. AN SSSR 99/6, 1049-1052, Dec 21, 1954

Abstract : It is shown that the hydrocarbon cracking reaction can be initiated by small additions of certain substances even in conditions where cracking reactions are almost impossible, e.g., at very-low temperatures. At such conditions (low temperature) the substance serving as initiators when introduced into the reactor begin decomposing forming radicals which in turn result in a chain decomposition of the hydrocarbons subjected to cracking. The initiation produced by the radicals introduced into the reaction zone, is explained on the basis of the chain theory which appears to be the best proof of the chain process. The initiating effect of azomethane depends upon the percentage-content of azomethane in the mixture. The difference in the initiating effect of azomethane in the case of propane and isobutane is explained by the difference in the steric factors. Twelve references; 6-USA and 6-USSR (1927-1953)Graphs.

Institution: The M.G. Chernishevskiy State University, Saratov

Presented by: Academician V.N. Kondratyev, June 25, 1954

STEPUKHOVICH, A.D.

USSR/ Chemistry - Physical chemistry

Card 1/1 Pub. 147 - 5/22

Authors : Stepukhovich, A. D., and Etingof, Ye. I.

Title : Steric factors of elementary reversible reactions of H- and CH₃-radicals with simple olefines

Periodical : Zhur. fiz. khim. 29/11, 1974-1983, Nov 1955

Abstract : Experiments showed that the steric factors in reactions leading to displacement of H-atoms by olefine molecules and resulting in the formation of complex unsaturated radicals have a value of 10^{-3} . The steric reaction factors of complex radicals having a double bond with the hydrogen molecule were found to have a value much lower than the steric factors of reversible reactions. Reactions of complex radicals with simple molecules showed much lower values of the steric factors than reactions of simple radicals with complex molecules. Fifteen references: 13 USSR and 2 USA (1948-1955). Tables.

Institution : Saratov State University im. N. G. Chernyshevskiy

Submitted : October 23, 1954

STEPUKHOVICH, A.D.; DEREVENSKIKH, L.V.

Kinetics and mechanism of hydrocarbon decomposition. Part 7.
Kinetics and mechanism of the decomposition of gaseous alkanes in
presence of allene. Zhur.fiz.khim. 29 no.12:2129-2132 D '55.

(MLRA 9:5)

1. Saratovskiy gosudarstvennyy universitet imeni N.G. Chernyshev-
skogo.

(Paraffins)

Stepukhovich, P. D.

6

Retardation and acceleration of cracking of paraffin hydrocarbons by addends of tetramethylethylene. A. D. ~~Stepukhovich~~ and E. P. Neklin (N. G. Chernyshevskiy Inst. Chem., Saratov). Doklady Akad. Nauk S.S.S.R. 105, 917-9 (1955).—Addn. of 20 mm. partial pressure of tetramethylethylene to propane followed by pyrolysis at 502° results in a great acceleration of cracking of propane; at 502° the acceleration appears after a 30 sec. induction period; at 545° the induction period extends to 60 sec. and at 573° retardation of cracking is evident. With isobutane at 573° a max. retardation occurs with 1% addend in the initial phases, after which acceleration takes place. At 548° retardation takes place, the degree of which varies with the amount of the addend, except for large concns. of the addend (over 1.5%) which cause a moderate acceleration of cracking. Tetramethylethylene alone shows decreased amount of decompn. in 548-73° range with increase of pressure from 2 mm. to 8 mm. G. M. Kosolapoff

RM

Stepukhovitch, A. D.

290

USPEKHI KHIMII

Progress in Chemistry

Vol 25, Nr 3, March, 1956, pp 257-392

Chem
STEPUKHOVICH, A. D.:

Steric Factors of Radical Reactions in Chemical Kinetics

Chemical-kinetic theory is examined and equations for calculating steric factors for various types of radical reactions are deduced. Values for several forward and reverse reactions are tabulated.

PM

USSR/Physical Chemistry - Kinetics. Combustion.
Explosives. Topochemistry. Catalysis.

B-9

Abs Jour : Referat Zhur - Khimiya, No 2, 1957, 3778

Author : Stepukhovich A.D.

Title : Kinetics and Mechanism of Initiation of Cracking of
Paraffin Hydrocarbons

Orig Pub : Zh. fiz. khimii, 1956, 30, No 3, 556-565

Abstract : A mechanism is proposed, of the initiated cracking (C) of hydrocarbons, which is based upon the concept that the initiator (I) not only accelerates but also slows down C. Reactions of isomerization of certain radicals are of significance in the propagation of chains. A kinetic equation is derived for the rate of C, and integration of the equation is effected, taking into account change in concentration of I. At low concentrations of I the rate of C increases linearly with increase in relative concentration of I. At higher

Card 1/2

- 115 -

SECRET
Category USSR

B 9

Abs Jour Zh. Kh. No 3, 1957, 7520

Author Stepukhovich, A. D. and Kaplan, Ye. G.

Inst Not given

Title Kinetics and Mechanism of the Decomposition of Hydrocarbons.
I. Initiation of the Cracking of Ethane by the Addition of Azo-
methane

Orig Pub Zh. Fiz. Khimii, 1956, Vol 30, No 4, 928-933

Abstract It has been shown that azomethane (I) initiates the cracking of
ethane at 368°; the extent of cracking, however, is less than
that observed with other hydrocarbons. The initiating effect
of I depends on the rate of its decomposition. Increasing the
concentration of I decreases its effectiveness. A mechanism
for the initiation step of the reaction is given based on the double

Card 1/2

-6-

Category USSR

B 9

Abs Jour. Zh-Kh. No 3, 1957, 7520

role of I (RZhKhim, 1957, 3778). The smaller effect of I on the cracking of C_2H_6 is due to the slow rate of the reaction $CH_3 + C_2H_6 \rightleftharpoons CH_4 + C_2H_5$ as well as to the fact that the equilibrium $C_2H_5 \rightleftharpoons C_2H_4 + H$ is shifted to the left at low temperatures. A kinetic equation for the cracking is given.

Card 2/2

-7-

PM
SMB

Category. USSR / Physical Chemistry - Kinetics. Combustion.
Explosives. Topochemistry. Catalysis.

B-9

Abs Jour: Referat Zhur-Khimiya, No 9, 1957, 29986

Author : Stepukhovich A. D., Bakhareva I. F.

Inst : not given

Title : Reply to the Comments of Yu. S. Sayasov

Orig Pub: Zh. fiz. khimii, 1956, 30, No 6, 1407-1409

Abs **APPROVED FOR RELEASE: 08/26/2000** **CIA-RDP86-00513R001653220020-0"**
the paper by the authors (RZhKhim, 1955, 23283).

Category: USSR / Physical Chemistry - Kinetics. Combustion.
Explosives. Topochemistry. Catalysis.

B-9

Abs Jour: Referat Zhur-Khimiya, No 9, 1957, 29993

Author : Stepukhovich A. D., Krol' I. K.

Inst : not given

Title : Kinetics and Mechanism of Decomposition of Hydrocarbons. VIII.
Effect of Additions of Butylenes on Kinetics of Cracking of
Gaseous Alkanes.

Orig Pub: Zh. fiz. khimii, 1956, 30, No 8, 1718-1726

Abstract: Additions of a mixture of butenes and 1-butene, at 612 and 635° and a pressure of 20 mm Hg, inhibit cracking (C) of C_2H_6 . Slowing down at 635° is observed after 1.5 minute following beginning of the reaction and increases thereafter. On lowering of the temperature of C (612°) inhibition becomes manifest during later stages of the reaction. Inhibition is caused by the product of decomposition of butenes, namely by propylene. Experimental data on C of C_2H_6 , in the presence of added butenes, satisfy the equa-

Card : 1/2

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Category: USSR / Physical Chemistry - Kinetics. Combustion.
Explosives. Topochemistry. Catalysis.

B-9

Abs Jour: Referat Zhur-Khimiya, No 9, 1957, 29993

tion of an inhibited C (RZhKhim, 1953, 8215). Additions of butenes do not inhibit the C of C_3H_6 at 590-620° and C of butanes at 548-574°, and even accelerate the C of C_3H_6 , somewhat, due to decomposition of butenes. On C of C_3H_6 and butanes the auto-inhibition by decomposition products (C_3H_4 and iso- C_3H_4) overlaps the slowing down effect of additions. Decomposition of 1-butene was also studied. Part VII, see RZhKhim, 1957, 11216.

Card : 2/2

-5-

Kinetics and mechanism of the cracking of hydrocarbons.

XII The effect of cyclohexane on the kinetics and mechanism of the cracking of gaseous alkanes. A. D. Kozlovskii and I. G. Kozlovskaya. Chem. Abstr. 50, 1975 62. The effect of the addition of cyclohexane to the thermal cracking of butane and propane was studied statically at 0.1-0.2 mm. and 540-600°. The initial pressure of I was found to be const. during the 10-min. period of cracking and I did not slow down the cracking of C_4H_{10} or C_3H_8 . The steric factors of the reactions $H_2 + C_4H_9 \rightleftharpoons H_2 + C_4H_9$ and $CH_4 + C_4H_9 \rightleftharpoons CH_4 + C_4H_9$ were calcd. by the method of S. (C.A. 50, 3856d) and were found to be almost 3 times greater for the 2nd reaction than for the first one. This was also the case in the reaction involving olefins (S. and Etingof, C.A. 49, 15392f). An evaluation of the heat effects and of the activation energies of the two reactions with cyclohexane show that these reactions may occur. The behavior of the C_4H_9 radical under cracking conditions may be explained by its greater similarity to paraffins, with respect to adsorption on the walls of the vessel, than to olefins.

W. M. Sternberg

RM gmb mt

STEPUKHOVICH, A.D.

Equilibrium in addition and substitution reactions of H and CH_3 radicals with unsaturated and saturated hydrocarbons. Zhur. fiz. khim. 30 no.11:2387-2398 N '56. (MLRA 10:4)

1. Saratovskiy gosudarstvennyy universitet im. N.G. Chernyshevskogo.

(Hydrocarbons) (Chemical reaction--Mechanism)
(Substitution (Chemistry))

Stepukhovich, M.D.

✓ Effect of temperature on steric factors in simple and radical reactions. A. D. Stepukhovich (N.G. Chernyshevskii State Univ., Saratov). *Doklady Akad. Nauk S.S.S.R.* 107, 436-9 (1955).—The validity of the usual comparison of reactivities based exclusively on activation energies and ignoring steric factors is critically examined. For reactions with high activation energies such comparison is fairly valid, since the alterations in steric factors are not usually large enough to predominate. For reactions with low activation energies, including especially free radical reactions, the steric factors can be of foremost importance, and can even be responsible for the observed temp. dependences of the reaction rate consts. The temp. coeffs. of steric factors in 1st- and 2nd-order reactions are derived from the basic equations interrelating the collision and transition-state theories. It is principally the vibrational partition functions of the reactants and the activated complex that determine the temp. coeffs. Only those vibrations in bonds undergoing change need be considered; this makes evaluation of temp. coeffs. of steric factors reasonably simple and straightforward even in reactions involving fairly complex mol.

John R. Kossak

*KB
myr*

STEPUKHO, A. D.

✓The kinetics of the multicentered chain retardation of propane and isobutane decomposition. A. D. Stepukho and B. I. Khalkin (N. G. Chernyshevskii State Univ., Saratov). *Zh. Fiz. Khim.* 51, 123-22 (1957).—The kinetic equation for the retarded chain breaking, with participation of 3 active centers (C.I. 40, 50584; 50, 52579), $1/(w - w_0) = A' + B'c_{add}$, (w is the rate of decomposition, the residual decomposition rate at complete inhibition, c_{add} , the concn. of the retarding addn., B' a const. connected with the const. of the inhibited reaction, and A' is connected with the interaction of the active centers with the vessel walls), is also applicable to more complex hydrocarbons, such as butane and propane. The velocity const. of the substitution reactions of different radicals with the same

rad. or unrad. mol. are in a const. proportion, which can be used to calc. the unknown const. W. M. S. erratum.

Stepukhovich, A.D.

USSR/Chemical Technology - Chemical Products and Their
Application. Treatment of Natural Gases and Petroleum.
Motor and Jet Fuels. Lubricants. I-8

Aos Jour : Ref Zhur - Khimiya, No 1, 1958, 2548

Author : Stepukhovich, A.D.

Inst : -

Title : Concerning the Nature of Residual Velocity of Fully Decelerated Cracking of Paraffin Hydrocarbons.

Orig Pub : Zh. fiz. khimii, 1957, 31, No 2, 511-512

Abstract : Residual velocity of cracking of paraffin hydrocarbons decelerated by additives, is considered as the velocity of a certain residual chain reaction, corresponding to a certain steady state of decelerated cracking. It is noted that the reaction of disproportionation between allyl radicals and molecules of olefins can be of significance also in the case of cracking of paraffins. In this case the residual velocity is also the velocity of a steady state

Card 1/2